Opportunity To Comment
U.S. Forest Service
Black Hills National Forest
Needles Area Old Growth Report

On August 30, 2004, the Old Growth Committee, which was appointed by Forest Supervisor John Twiss in January 2004, released their Needles Area Old Growth Report. This report was a requirement of "The 2002 Supplemental Appropriations Act for Further Recovery from and Response to Terrorist Attacks on the United States" (Section 706, Public Law 107-206-August 2, 2002). The applicable section reads as follows:

> (f)(2) Research committee. By December 1, 2003, the Secretary shall select a committee composed of research scientists who are federal employees to recommend an old growth research area within the Needles area (outside the Needles Timber Sale cutting units). By December 1, 2004, the committee shall make its recommendations to the Secretary. The committee's recommendations shall be subject to public notice, review and comment.

This report is not an environmental document subject to appeal and makes no decisions to implement any course of action. This report applies only to the Black Hills National Forest. The Forest Service may consider parts or all of the information and recommendations in this report in future planning decisions.

This report may be accessed on the web at: www.fs.fed.us/r2/blackhills/

Please submit your comments by October 15, 2004 to Blaine Cook at (605 673-9243) or to:

Mr. Blaine Cook
Black Hills National Forest
25041 N. Highway 16
Custer, SD 57730

Report of Committee of Forest Service Research Scientists Recommending Old-Growth Research Areas within the Needles Timber Sale, Black Hills, NF

Wayne D. Shepperd, Ph.D.
Jose Negron, Ph.D.
Jack Butler, Ph.D.
Mark Rumble, Ph.D.[1]

Introduction

Forest Supervisor John Twiss selected this committee in January, 2004 to accomplish the following task as outlined in Section 706, Public Law 107-206-August 2, 2002, The 2002 Supplemental Appropriations Act for Further recovery from and Response to Terrorist Attacks on the United States, which reads as follows:

> *(f) (2) Research committee. By December 1, 2003, the Secretary shall select a committee composed of research scientists who are federal employees to recommend an old growth research area within the Needles area (outside the Needles Timber Sale cutting units). By December 1, 2004, the committee shall make its recommendation to the Secretary. The committee's recommendation shall be subject to public notice, review and comment*.

The Committee met with Black Hills NF staff in March 2004 to discuss our specific mission. Several criteria regarding our assignment were clarified at this meeting. First, any land areas that we might recommend as old growth research areas would not be designated Research Natural Areas, as legislation and regulations to establish such areas already exists. From this we assumed that it would be possible to select areas where observational and manipulative research to maintain or enhance old-growth conditions could be conducted. We also asked for clarification regarding what the term "Needles area" meant in the law and were told to restrict our analysis to areas within the Needles Timber Sale boundary, but outside of any designated cutting units.

The Black Hills NF furnished us with inventory data, sale area maps and aerial photos of the Needles Timber Sale area. We surveyed parts of the Needles Timber Sale in March, 2004. It was evident some areas within the Needles Timber Sale still contained a component of large trees that were established prior to the 1870's. However, some areas appeared to be heavily stocked with younger trees. Most of these areas were remote and not easily accessible in winter, so we decided to return following snowmelt to further explore the area and gather data from potential candidate sites.

Meanwhile, we requested that the Black Hills NF staff provide us with existing forest inventory data and GIS maps of the location of cutting units and the boundary of the Needles Timber Sale as well as recent aerial photos that had been assembled into a GIS overlay. From these and our initial survey of the area, we identified several potential

[1] Research Silviculturist, Research Entomologist, Research Ecologist, and Research Wildlife Biologist USDA Forest Service, Rocky Mountain Research Station.

sites for groundtruthing. We returned in April and spent two days visiting these sites. To help verify our visual impressions, we collected quantitative data on tree stocking by diameter class from a series of Basal Area Factor cruise points in each site that we visited. In addition, we cored a number of large trees with an increment borer to obtain information about their ages and growth rates. We also collected digital photos representing the forest conditions that we encountered.

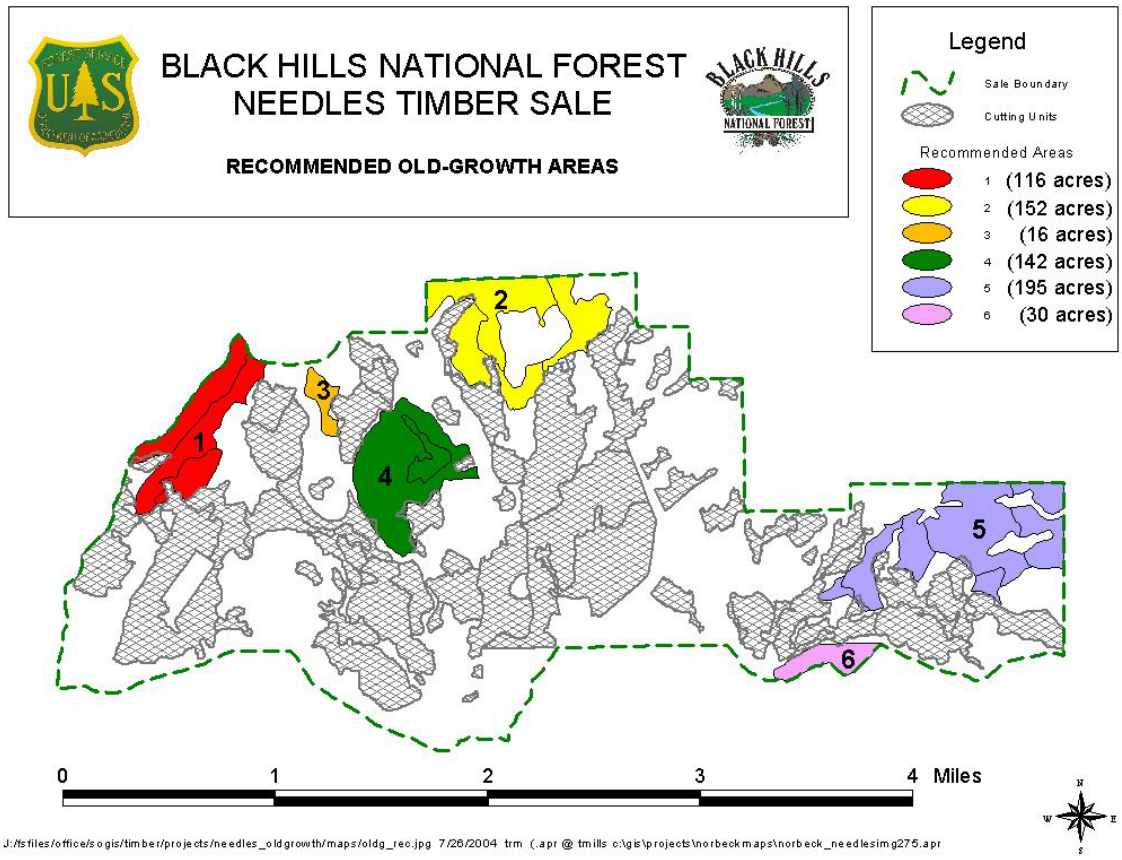
General Description of the Needles Timber Sale area

The Needles Timber Sale comprises 3950 acres in the central granite core of the Black Hills. Located north of the town of Custer, SD, Custer State Park abuts the north and east sides of the sale area while Sylvan Lake road forms the western boundary. Topography consists of steep ridges and valleys interspersed with the numerous large granite monoliths that give the Needles area its name.

Most of the area not occupied by rock monoliths is forested in ponderosa pine with some white spruce, aspen, and birch interspersed. Although the area is part of the Norbeck Wildlife Preserve it is not pristine. Numerous old stumps, found in all but the most inaccessible areas, give evidence that post settlement-era logging occurred. A number of small clear-cut openings where trees were felled in the 1980's to benefit wildlife are also evident.

Summary of potential old-growth research areas

The sites that we selected for consideration as old growth research areas have several common characteristics. As specified in Public Law 107-206, they are all outside of the Needles Timber Sale cutting units.



All contain pre-settlement era trees as the dominant overstory component of the forest. Also, in the opinion of this committee, all contain additional attributes that warrant consideration as old growth research areas.

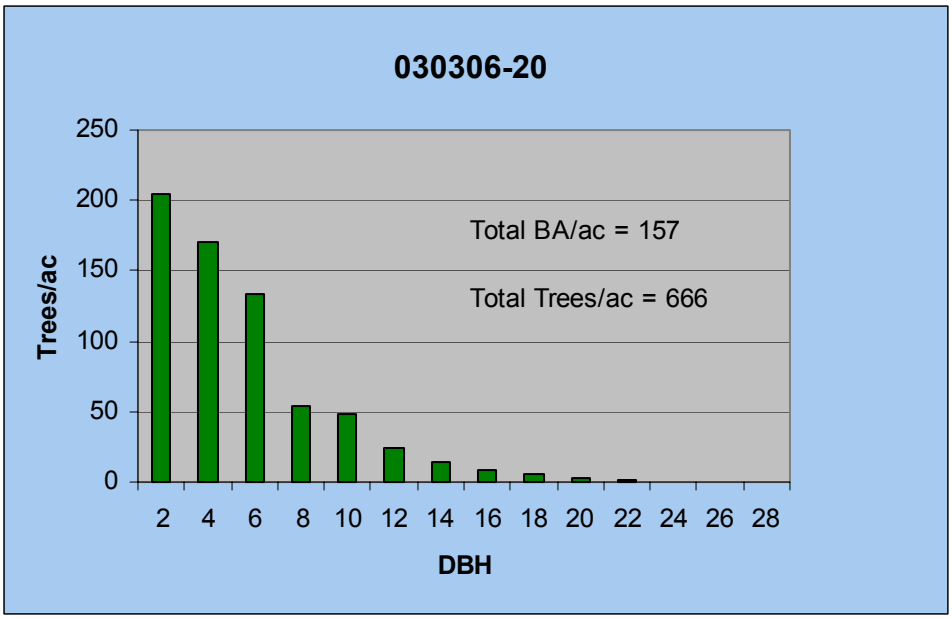
Stand Descriptions

Site 1. (116 acres) This site is located on a north-facing slope above the Sylvan Lake road on the extreme western edge of the Needles sale area. The stand is comprised of dense pole-sized ponderosa pine with older pre-settlement trees scattered throughout. The site is very steep, which probably prevented it from being included as a Needles Timber Sale harvest unit. This stand is probably denser than pre-settlement old-growth forests were. The dense condition of this stand and the presence of numerous trees larger than 6 in dbh make it quite susceptible to a mountain pine infestation. The steep terrain may impede management options for reducing mountain pine beetle susceptibility or the utilization of beetle-killed trees. The crowded nature of the stand with an abundance of ladder fuels may contribute to the occurrence of crown fire. Opportunities for manipulation of forest stocking and structure to retain or enhance old-growth characteristics are probably limited because of the economics of operating on steep terrain. However, the site does provide an opportunity to observe and document the effects of natural disturbances such as mountain pine beetle or fires that might alter the old-growth attributes of this site.

Site 2. (152 acres) The committee visited this site and collected inventory and age data. The ponderosa pine forest in this area consists of patches, groups and scattered individual large pre-settlement trees with a second canopy layer of younger trees that established following settlement-era harvests. Dense groups of smaller suppressed saplings are also present, as well as scattered small openings in the overstory canopy, resulting in a very diverse forest structure.

The diverse stocking of this stand is typical of an uneven-aged forest and similar to published descriptions of pre-settlement forests in the Black Hills (Graves 1899[2]). One difference is that the numerous small trees have grown to the point of critically increasing basal area which results in increased stress and the possibility of losing the larger old trees to mountain pine beetle attack. The density of small trees also increases the risk of crown fire in the stand. Our data are summarized below.

[2] Graves, H. S. 1899. The Black Hills Forest Reserve. In: The nineteenth annual report of the survey, 1897-1898. Part V. Forest Reserves. Washington, DC: U.S. Geological Survey: 67–164.



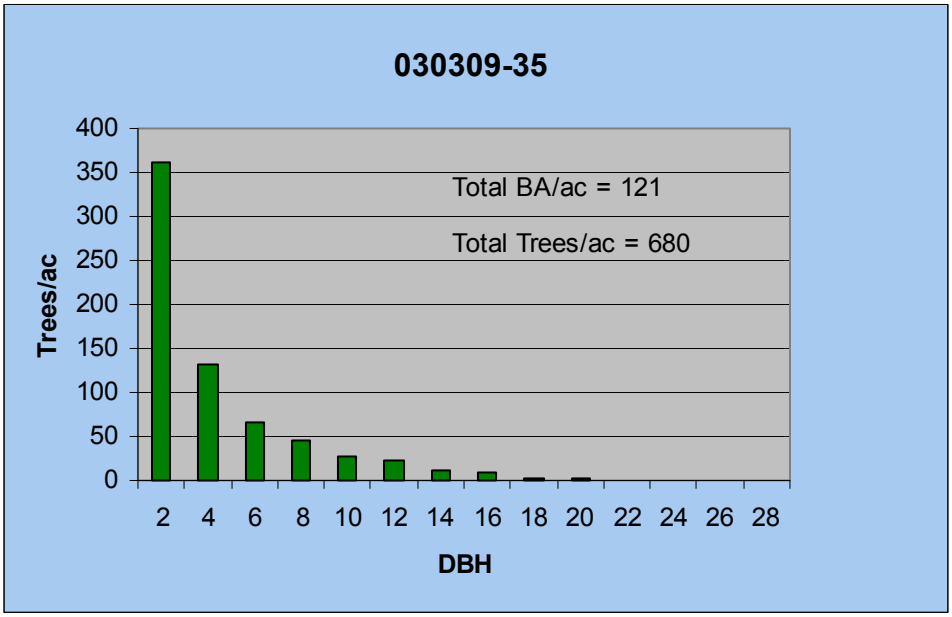
The distribution of trees on this site offers the potential of testing silviculture manipulations to enhance the old-tree component of the forest while reducing the risk of beetle attack, crown fire, and associated loss of wildlife habitat. These manipulations could also present an opportunity to examine uneven-aged stand susceptibility to mountain pine beetle. Most of the knowledge base accumulated to date on ponderosa pine susceptibility to mountain pine beetle in the Black Hills comes from even-aged stands. Increased emphasis in uneven-aged management makes this opportunity even more valuable.

Site 3. (16 acres) Based on our reconnaissance of Site 2 and a similarity in structure and composition, we would also recommend this area (RIS polygon 30306-29) for inclusion as a research area.

Site 4. (142 acres) This site is somewhat different in composition than the other sites we visited, in that it is comprised of large granite rock outcroppings upon which some ponderosa pine are growing. The forest structure differs from other sites in that the stand is more open and the trees are generally smaller. However the site does contain numerous pre-settlement trees. We feel that the dynamics of the establishment and persistence of these old trees on this site is worthy of further study.

Site 5. (195 acres) The committee also visited this area to collect data. The forest in this area is similar in structure and composition to Site 3 and site 2, containing a dense understory of young trees under scattered large pre-settlement trees. Stocking averaged nearly 700 trees per acre, most of which were less than 8 inches. Basal area averaged 121 ft^2/acre, somewhat less than Site 3, but still beyond the threshold for increased susceptibility to mountain pine beetle activity. We did encounter isolated large trees that were being attacked by beetles. The presence of an endemic mountain pine beetle population in this site offers the opportunity to examine the how such populations may progress into eruptive populations in uneven-aged stands. The transition of populations

from endemic to eruptive levels needs further investigation. As in Site 3, the dense understory occurred in groups and clumps and contributes to a high risk of crown fire. Our data are summarized below.



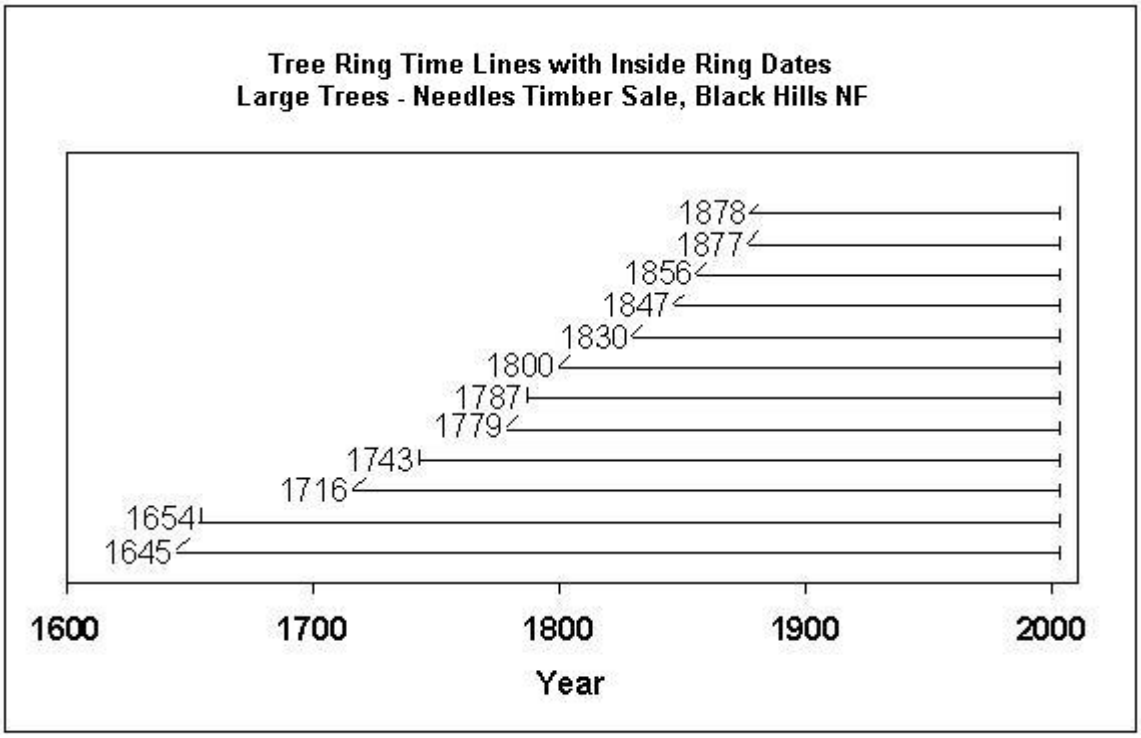
Some settlement-era stumps were evident in the lower portions of this area, but no past cutting was evident in portions of the site that were isolated by rock formations, or narrow rocky canyons. It was in these areas that we found trees up to 38 inched in diameter.

As with Site 3, we feel this site offers potential for research in a Black Hills Ponderosa pine type containing a component of old trees.

Site 6. (30 acres) This area is similar in structure and composition to Site 5 and is located outside of any Needles Timber Sale cutting units. Although it is small, it is part of a larger contiguous area of similar forest just outside of the Needles Timber Sale boundary. It could be a viable research area, if the adjoining forest were managed similarly.

Ages of Pre-Settlement Trees

On our visit to the Needles Timber Sale we cored several trees in the stands that we visited with an increment borer to determine the inside tree ring date. Cores were mounted and sanded in our Ft. Collins tree ring lab and crossdated by comparing the ring patterns to known key growth indicator years from tree ring chronologies developed in the Black Hills. This minimized the chances of mistakes in counting or interpreting annual ring growth. Because we cored the trees at dbh (4.5 ft.) we could not determine the trees exact age. However, given the growth rates of seedlings in the Black Hills, our age determinations were probably within a decade of the tree's true age.



We collected cores from twelve large diameter trees that we could use to estimate ages. We had tried to core a number of trees that were rotten and missed the center on several others to the extent that an accurate age estimate was not possible. The inside ring dates at dbh in our sample ranged from 1878, to 1645. Therefore it is reasonable to conclude that most of the large overstory trees in the Needles Timber sale area predate settlement of the Black Hills and meet our previously agreed-upon criteria for old-forest conditions.

Discussion

From several perspectives, the areas we visited represent unique habitats. The areas contain patches of various sizes that include some very large diameter old trees. Most of the large trees in these stands are likely to be over 130 years old and many are several hundred years of age. Regardless, most are as large or larger than any currently existing elsewhere in the Black Hills. Further, the often rough, steep, and rocky nature of the landscape in which these old trees occurred in is also unique but atypical of most Black Hills landscapes.

We believe that the areas we identified above should be further investigated (pending available funding) for their potential to serve as important representative old forest communities and habitat for unique species. While the forest structure currently existing on these sites contains remnants of that which likely existed in pre-settlement old growth forests, it also represents forests that have endured over a century without active fire and may contain stocking that otherwise would not be present. These excess trees are likely contributing to the increased mountain pine beetle activity that we observed in the area. The dynamics of the relationships between what we believe past old-growth conditions were like, and current conditions and the disturbance factors that may affect these forests is of considerable research interest. The fact that these sites are not in wilderness, or other protected lands is also of research interest, because it offers the possibility of establishing manipulative experiments or the use of powered equipment and instrumentation to help understand how such forests should be protected or managed to maintain their old growth condition.

Mountain pine beetle is a major disturbance agent in the ponderosa pine forests of the Black Hills and contributes to shaping forest structure. A significant portion of the stands identified by the committee as potential old-growth study areas are susceptible to mountain pine beetle due to increased stocking levels. Reducing stand densities in some of these areas by removing understory trees may increase the likelihood of preserving the old-tree component of these forests. From a research perspective these areas offer opportunities to extend our knowledge of how mountain pine beetle acts in uneven-aged stands and the beetles transition from low-level populations into eruptive populations.

The relative importance of these plant communities for wildlife research is probably constrained by the habitat requirements of the wildlife species of interest. For example, relatively sedentary species and species with specific habitat needs, such as bats or perhaps brown creepers that might select characteristics typical of the old growth forest sites, could be studied in these areas. These areas could also provide a bench-mark for studies on snag decay dynamics and on wildlife species dependent on cavities in very large trees (both birds and bats). For bird species, the size of the areas surveyed and their spatial separation would limit the sample size for study purposes to 2 or 3 sites, depending on how many areas are ultimately identified, prospective treatments to maintain old forest conditions, etc.

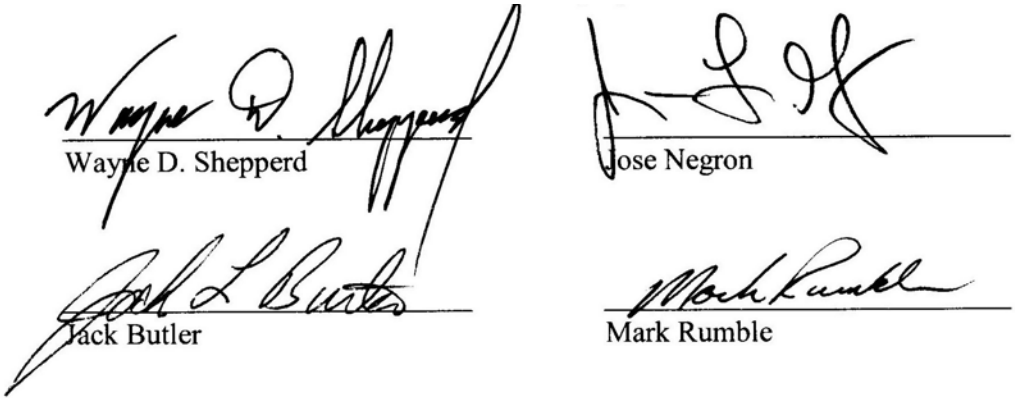
On the other hand, few, if any, research opportunities likely exist for larger wider ranging species such as turkeys, deer, elk, hawks, etc. The forest patches identified would only comprise a very small portion of habitat; consequently, with the wide range of daily and

seasonal movements of individual animals there probably would not be sufficient numbers of these animals in the particular area to provide adequate sample sizes for studies designed to determine habitat associations.

We recognize that we were constrained to evaluate the area defined by the Needles timber sale boundary. However, our review of the GIS layers of the surrounding areas suggests that other sites containing stands of old trees may be in the vicinity. If these areas could be identified and included for research studies, they may increase the spatial distribution of forest stands with similar characteristics. Further, the juxtaposition of the potential old growth stands in the context of a more heavily managed landscape is also an important consideration for studies on wildlife habitat relationships, stand dynamics, ecology and management of invasive species (plants and insects), etc.

The habitat conditions in these old forest stands suggest a rapidly increasing component of younger trees. Vegetation treatments will likely be necessary to maintain the old growth nature of these stands for long-term studies. However, some of the areas with high densities of advanced regeneration beneath the old trees would provide a different set of habitat conditions that, if strategically placed, could be used for comparative studies.

In conclusion, the committee feels that there are several areas totaling 651 acres within the boundaries of the Needles Timber that could be utilized to advance our knowledge of the ecology and management of older Black Hills ponderosa pine forests. Although these areas are not large or easily accessible, we feel that they still have utility in studying stand-level responses to both management manipulation and natural disturbance factors and recommend their designation for such purposes.



Wayne D. Shepperd

Jose Negron

Jack Butler

Mark Rumble

August 2004

Acknowledgements
We would like to acknowledge Black Hills National Forest employees, Blaine Cook, Mike Lloyd, and Ken Marchand, who provided invaluable help and resources to this effort.